

Report of Investigation  
Analysis of the 2004 BLM Monitoring Database

May 18, 2006

## Analysis of the BLM 2004 Monitoring Data Base

The dataset collected during the 2004 monitoring survey was delivered to the Carlsbad Fish and Wildlife Office on August 15, 2005. The data was delivered as an ESRI ArcInfo coverage. We added one new attribute field to the data to facilitate comparison between areas open to OHV activity and those currently closed to OHV activity. This latter category includes the North Algodones Wilderness and four temporary closures established in 2001. Additional baseline statistics were also derived from the data for number and percentage of occupied cells by management area and closure status.

To test for expected presence of PMV within areas closed to OHV activity, we conducted two Chi-square tests on the data. In the first Chi-square test we selected 5.1% or 6,327 of the total 123,488 records, by beginning at a random start point and selecting every 31<sup>st</sup> and 51<sup>st</sup> record. For the second Chi-square test we selected 1% of the data by selecting every 191<sup>st</sup> and 211<sup>th</sup> record for a total of 1,228 records (0.99%). We then used Fisher's Exact Test to report an odds ratio.

Our Chi2 analysis violates assumptions of independence to the extent that data cells included in the analysis were gathered from predefined transects. This violation may not be serious, as the transects were randomly situated and covered a large proportion of the dunes, and we used only a small percentage of the sample points, and those points were spaced widely apart. Regardless, the data had not been collected to optimally be incorporated into our analysis. Therefore, our results cannot be interpreted as definitively demonstrating an impact by OHVs. This analysis does strongly suggest that area status (closed or not closed) may influence the presence of PMV. Certainly it indicates that future monitoring efforts may increase their statistical efficiency by sampling according to closure status rather than just by the political boundaries of the management areas.

## Results of Our Analysis

Milk-vetch plants were found in cells open to OHV activity as well as in cells closed to OHV activity. However, occupied cells were not randomly distributed among the surveyed cells in the seven management areas. Of the total 37,169 cells surveyed during the 2004 monitoring season, 1,283 cells (3.5%) had at least one ASMAP plant while 35,886 (96.5%) had no ASMAP. Among the management areas, Gecko had the highest occupancy rate with 9.4% of cells occupied, followed by the Glamis (5.4%), Ogilby (3.6%), AMA (3.2%), Mammoth Wash (1.8%), Wilderness (1.5%), and Buttercup (0.6%) (see Table 1).

Among all seven management areas, there were 10,975 (29.5% of total) cells surveyed that were closed to OHV activity. No cells were closed to OHV activity in the Buttercup Management Area while all cells in the Wilderness and AMA were closed. Four management areas included cells open to OHV activity as well as cells closed to OHV activity. Of these, Gecko had the highest percentage (70.1%) of occupied cells closed to OHV activity followed by Mammoth

Wash (64.9%), Ogilby (61.8%) and Glamis (21.9%). Seventy-three point three percent of the entire observed population occurred in cells that were closed to OHV activity. Of the mixed use management areas, Ogilby had the highest proportion of its ASMAP population in cells closed to OHV activity (83.5%), followed by Mammoth Wash (80.8%), Gecko (65.3%) and Glamis (23.3%) (see Table 1).

There were 25,798 plants observed during the 2004 surveys. Half of these occurred in just 26 cells (2.0 percent of occupied cells, 0.07% of total cells). The median number of occupied cells had three or fewer plants per cell. By management area, the total number of plants found and the percentage of occupied cells that contained half of that total is for the Ogilby 15,803 individuals and 5.0% of occupied cells, for Gecko 3,330 individuals and 7.9% of the occupied cells, for AMA 2,668 individuals and 7.9% of the occupied cells, for the Glamis 2,207 individuals and 6.6% of the occupied cells, for Buttercup and 4.5% of the occupied cells, and for Mammoth Wash 439 individuals and 7.4% of the occupied cells. The Wilderness had the lowest observed population with 432 observed plants, half of which occurred in 13.2% of occupied cells (see Table 2).

The Chi-square ASMAP occupancy analysis of cells open and closed to OHV activity was perhaps the most revealing. Sampling 5% of cells, 1,844 records, reported Fisher's Exact Test  $p = 0.1678$ ). The odds of finding ASMAP in cells closed to OHV activity was 1.45 times greater than finding a plant in the open area (95% confidence interval = 0.855 – 2.496).

We conducted the same odds analysis for the Gecko Management Area. Sampling 22% of cells, 4,698 cells, resulted in Fisher's Exact Test  $p < 0.0001$ ). The odds of finding ASMAP in the closed areas of Gecko was 2.29 (95% confidence interval = 1.456 – 3.686) times greater than finding it in the open area. Seventy percent of the observed population of Gecko occurred in areas closed to OHV activity.

## Discussion

The 2004 monitoring was the most extensive survey for Peirson's milk-vetch to date. Light Fall rains followed by moderate rainfall in February and March 2004 resulted in late germination for most plants. The largest portion of standing plants were non-flowering (94%). Based on our additional analysis of the BLM 2004 monitoring database identifying cells as to whether they were open or closed to OHV activity, ASMAP plants occurred in only 3.5% of the cells sampled throughout the dunes, with approximately 73% of the observed population occurring in areas recently or permanently closed to OHV activity. Calculated dunes-wide plant density was about 27.6 plants/hectare for areas closed to OHV activity compared to 4.2 plants/hectare for areas open to OHV activity.

Of the four management areas both open and closed to OHV activity, three had two-thirds or better of their observed population within areas closed to OHV activity. Glamis, with 18.4% of surveyed cells within areas closed to OHV activity, had 23.3% of its observed population within those closed areas. This small area, and the geographic position of Glamis on the eastern edge of ASMAP concentrations, likely contributed to this low proportion.

In the Gecko Management Area, 47.4% of the sampled area occurred within the temporary closures. Yet 65.3% of the observed population occurred in these closures. In Ogilby, only 11.6% of the sampled area occurred within the temporary closure. But the vast majority (83.5%) of the observed population in Ogilby was located in cells in the temporary closure, yielding a calculated plant density of 328 plants/hectare compared to 8.5 plants/hectare in the open area of Ogilby. Ogilby's rank as the management area with the highest density in the 2004 monitoring report was almost entirely due to cells in the small temporary closure. Ranking Gecko with the second highest density may also be due to the closures. Calculated plant density for the closed areas of Gecko was twice that of the open area (15.6 plants/hectare for closed areas compared to 7.5 plants/hectare for the open area). All of this information indicates that areas closed to OHV activity were important contributors to the overall milk-vetch population. This is compounded by the fact that 54.6% of the cells occupied by ASMAP were in the areas closed to OHV activity, accounting for 73.3% of the observed population. All life stages of ASMAP, from seedling to reproducing, were about two times or better more likely to occur in areas closed to OHV activity.

The low odds of finding plants in closed areas compared to areas open of OHV activity is most likely due to the fewer number of cells occupied by ASMAP. Only 3.5% of the cells surveyed were occupied by ASMAP; 3.0% in the open area and 4.4% in the closed area. Therefore, there was less statistical power to detect differences in cell occupancy between cells in open and closed areas. This does not mean the difference didn't exist, but that it was less detectable.

In general, ASMAP is sparsely very distributed throughout ISDRA in 2004. Only 3.5% of the surveyed area was occupied by ASMAP in 2004 and half the sampled cells occupied by ASMAP had 3 or fewer plants per cell. But ASMAP does occur in higher concentrations. Half the total observed population occurred in approximately 0.07% of all cells sampled, 2.0% of occupied cells, indicating that a very large portion of the population occurred within highly clustered areas.

The information presented herein is used to characterize ASMAP distribution and abundance in the spatial context of closure status. We invite you to verify the results we present and consider the importance of areas closed to OHV activity as they relate to the long-term stability of ASMAP.

Table 1: Cells occupied with ASMAP by management area.

Management Area (MA)	Total # cells surveyed	# surveyed cells occupied by ASMAP	% total surveyed cells occupied by ASMAP	% cells open to OHV occupied by ASMAP	% cells closed to OHV occupied by ASMAP	percent occupied cells in MA open to OHV activity	percent occupied cells in MA closed to OHV activity
Mammoth Wash	5,340	94	1.8	1.2	2.5	35.1	64.9
Wilderness	8,488	129	1.5	0.0	100.0	0.0	100.0
Gecko	4,698	445	9.4	5.4	14.2	29.9	70.1
Glamis	4,482	242	5.4	5.2	6.4	78.1	21.9
AMA	4,807	152	3.2	0.0	100.0	0.0	100.0
Ogilby	5,562	199	3.6	1.5	19.1	38.2	61.8
Buttercup	3,792	22	0.6	100.0	0.0	100.0	0.0
Entire Dunes	37,169	1,283	3.5			45.4	54.6

Table 2. Observed population and cell occupancy.

Management Area (MA)	Observed Population	% total observed population	% occupied cells below median population	% occupied cells above median population	# plants/cell below median cell number	% MA population in cells open to OHV activity	% MA population in cells closed to OHV activity
Mammoth Wash	439	1.7	92.6	7.4	2	19.2	80.8
Wilderness	432	1.7	86.8	13.2	1	0.0	100.0
Gecko	3,330	12.9	92.1	7.9	2	34.7	65.3
Glamis	2,207	8.5	93.4	6.6	2	76.7	23.3
AMA	2,668	10.3	92.1	7.9	4	0.0	100.0
Ogilby	15,803	61.3	95.0	5.0	10	16.5	83.5
Buttercup	919	3.6	95.5	4.5	9	100.0	0.0
Entire Dunes	25,798	100.0	98.0	2.0	3	26.7	73.3
Closed Areas	18,913	73.3	97.9	2.1	3		